IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

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Serial No.: ART UNIT:

Division of Serial No. 09/652,826
filed August 31, 2000 EXAMINER:

Filing Date: December 31, 2001

For: CONDUCTIVE POLYMER CONTACT SYSTEM AND
TEST METHOD FOR SEMICONDUCTOR COMPONENTS

Attorney Docket No. 00-0557.1

PRELIMINARY AMENDMENT
SUBMITTED WITH CONTINUING APPLICATION
UNDER 37 CFR 1.53(b)

December 31, 2001

Assistant Commissioner of Patents
BOX PATENT APPLICATION
Washington, D.C. 20231

Sir:

This Preliminary Amendment is being filed with a divisional application under 37 CFR 1.53(b). Please amend the captioned case as follows.

In the Specification

On page 2, line 1, add the following:

--Cross Reference To Related Applications

This application is a division of application serial no. 09/652,826 filed August 31, 2000.--

In the Claims

Please cancel claims 1-20.

Following is a clean version of the pending claims.

CLEAN VERSION OF PENDING CLAIMS

21. A method for testing a semiconductor component having a plurality of terminal contacts comprising:

providing a board comprising a plurality of contacts in electrical communication with test circuitry;

providing a substrate on the board;

providing a plurality of movable test contactors on the substrate comprising first contacts including conductive polymer layers configured to electrically engage the terminal contacts and second contacts including conductive polymer layers in electrical communication with the first contacts and configured to electrically engage the contacts;

placing the component on the substrate with the terminal contacts in electrical communication with the first contacts and the second contacts in electrical communication with the contacts; and

applying test signals through the test contactors and the terminal contacts to the component.

22. The method of claim 21 wherein the substrate comprises a plurality of grooves separating the contactors and forming flexible segments for the contactors.

23. The method of claim 21 further comprising applying a force to the component during the placing step.

24. The method of claim 21 wherein the substrate is configured to float on the board.

25. The method of claim 21 wherein the terminal contacts comprise an element selected from the group consisting of leads, bumps and pads.

26. The method of claim 21 wherein the placing step is performed using a test handler.

27. A method for testing a semiconductor component having a terminal contact comprising:

providing a board comprising at least one contact in electrical communication with test circuitry;

providing a substrate on the board comprising at least one contactor configured to simultaneously electrically engage the contact and the terminal contact, the contactor comprising a first conductive polymer layer on a first side of the substrate configured to electrically engage the terminal contact, and a second conductive polymer layer on a second opposing side of the substrate in electrical communication with the first conductive polymer layer configured to electrically engage the contact;

placing the component on the board with the first conductive polymer layer in electrical communication with the terminal contact and the second conductive polymer layer in electrical communication with the contact; and

applying test signals through the terminal contact, the contact, the second conductive polymer layer, and the first conductive polymer layer to the component.

28. The method of claim 27 wherein the substrate is configured to float in a Z-direction on the board,

29. The method of claim 27 wherein the substrate comprises grooves on either side of the contactor electrically isolating the contactor and forming a flexible segment on the substrate for the contactor.

30. The method of claim 27 wherein the terminal contact comprises an element selected from the group consisting of leads, bumps and pads.

31. The method of claim 27 wherein the component comprises an element selected from the group consisting of packages, BGA devices and modules.

32. A method for testing a semiconductor component having a plurality of terminal contacts comprising:

providing a board comprising a plurality of contacts in electrical communication with test circuitry;

providing a floating substrate on the board;

providing a plurality of test contactors on the substrate, each test contactor comprising a flexible segment on the substrate, a first conductive polymer layer on a first side of the flexible segment configured to electrically engage a terminal contact, and a second conductive polymer layer on a second opposing side of the flexible segment in electrical communication with the first conductive polymer layer and configured to electrically engage a contact on the board;

placing the component on the substrate with the terminal contacts in electrical communication with the test contactors; and

applying test signals through the test contactors and the terminal contacts to the component.

33. The method of claim 32 wherein the test contactors comprise an element selected from the group consisting of gold and platinum.

34. The method of claim 32 wherein the first conductive polymer layer and the second conductive polymer layer comprise an elastomeric base material and a plurality of conductive particles in the base material.

35. The method of claim 32 wherein the flexible segments allow the test contactors to move independently to accommodate dimensional variations in the terminal contacts.

36. The method of claim 32 wherein the terminal contacts comprise leads and the first conductive polymer layer comprises a plurality of conductive particles configured to penetrate a lead.

37. The method of claim 32 wherein the terminal contacts comprises bumps and the first conductive polymer layer comprises an indentation for engaging a bump.

38. The method of claim 32 wherein the terminal contacts comprise pads and the first conductive polymer layer comprises a bump for engaging a pad.

39. The method of claim 32 wherein the placing step is performed using a test handler.

40. The method of claim 32 wherein the substrate comprises an opening and the board comprises a pin for physically engaging the opening.

41. A contact system for a semiconductor component having a plurality of terminal contacts comprising:

a board comprising a plurality of contacts in electrical communication with external circuitry;

a substrate on the board comprising a plurality of contactors configured to simultaneously electrically engage the contacts and the terminal contacts;

each contactor comprising a first contact on a first side of the substrate configured to electrically engage a terminal contact on the component, and an anisotropic conductive polymer layer on a second opposing side of the

substrate in electrical communication with the first contact configured to electrically engage a contact on the board.

42. The contact system of claim 41 wherein the substrate comprises a plurality of grooves separating the contactors and forming flexible segments for the contactors.

43. The contact system of claim 41 further comprising a test handler configured to place and hold the component on the substrate.

44. The contact system of claim 41 wherein the substrate is configured to float on the board.

45. The contact system of claim 41 wherein the terminal contacts comprise an element selected from the group consisting of leads, bumps and pads.

46. The contact system of claim 41 wherein the external circuitry comprises test circuitry.

47. A contact system for a semiconductor component having a terminal contact comprising:

an interface board comprising at least one interface contact in electrical communication with external circuitry;

a substrate on the board having a first side and an opposing second side;

at least one contactor on the substrate configured to simultaneously electrically engage the interface contact and the terminal contact;

the contactor comprising a first contact on the first side configured to electrically engage the terminal contact, a second contact on the second side in electrical communication with the first contact, and an anisotropic conductive polymer layer configured to electrically engage the second contact and the interface contact.

48. The contact system of claim 47 wherein the substrate comprises a groove on either side of the contactor providing a flexible segment on the substrate for the contactor.

49. The contact system of claim 47 wherein the anisotropic conductive polymer layer comprises an elastomeric base material and a plurality of conductive particles in the base material configured to electrically engage the interface contact.

50. The contact system of claim 47 wherein the terminal contact comprises a lead and the first contact comprises a pad configured to physically engage the lead.

51. The contact system of claim 47 wherein the terminal contact comprises a bump and the contact comprises an indentation for the bump.

52. The contact system of claim 47 wherein the terminal contact comprises a pad and the first contact comprises a bump for engaging the pad.

53. The contact system of claim 47 wherein the component comprises an element selected from the group consisting of packages, ball grid array devices, and modules.

54. A contact system for a semiconductor component having a plurality of terminal contacts comprising:

an interface board comprising a plurality of interface contacts in electrical communication with external circuitry;

a substrate on the interface board having a first side, an opposing second side, and a plurality of grooves from the first side to the second side forming a plurality of flexible segments;

a plurality of contactors on the flexible segments configured to simultaneously electrically engage the interface contacts and the terminal contacts;

each contactor comprising a first contact on the first side of a flexible segment configured to electrically engage the terminal contact, a second contact on the second side of the flexible segment in electrical communication with the first contact, and an anisotropic conductive polymer layer electrically engaging the second contact and an interface contact.

55. The contact system of claim 54 wherein the first contact and the second contact comprise an element selected from the group consisting of gold and platinum.

56. The contact system of claim 54 wherein the anisotropic conductive polymer layer comprises an elastomeric base material and a plurality of conductive particles in the base material.

57. The contact system of claim 54 wherein the flexible segments allow the contactors to move independently to accommodate dimensional variations in the terminal contacts.

58. A contact system for a semiconductor component having a plurality of terminal contacts comprising:

a test circuitry configured to apply test signals to the component;

a test handler configured to move and support the component;

a board comprising a plurality of contacts in electrical communication with the test circuitry;

a substrate on the board comprising a plurality of contactors configured under a force applied by the test handler to the component to simultaneously electrically engage the contacts and the terminal contacts;

each contactor comprising a first contact on a first side of the substrate configured to electrically engage a terminal contact on the component, and a second contact on a second opposing side of the substrate in electrical communication with the first contact, and an anisotropic conductive polymer layer configured to electrically engage the second contact and a contact on the board.

59. The contact system of claim 58 wherein the substrate is configured to float in a Z-direction on the board,

60. The contact system of claim 58 wherein the substrate comprises a plurality of grooves electrically isolating the contactors and forming flexible segments on the substrate for the contactors.

61. A method for testing a semiconductor component having a plurality of terminal contacts comprising:

providing a board comprising a plurality of contacts in electrical communication with test circuitry;

providing a substrate on the board;

providing a plurality of movable test contactors on the substrate comprising first contacts configured to electrically engage the terminal contacts and second contacts in electrical communication with the first contacts, and an anisotropic conductive polymer layer proximate to the second side configured to electrically engage second contacts and the contacts;

placing the component on the substrate with the terminal contacts in electrical communication with the first contacts and the second contacts in electrical communication with the contacts; and

applying test signals through the test contactors and the terminal contacts to the component.

62. The method of claim 61 wherein the substrate comprises a plurality of grooves separating the contactors and forming flexible segments for the contactors.

63. The method of claim 61 further comprising applying a force to the component during the placing step.

64. The method of claim 61 wherein the substrate is configured to float on the board.

65. The method of claim 61 wherein the terminal contacts comprise an element selected from the group consisting of leads, bumps and pads.

66. The method of claim 61 wherein the placing step is performed using a test handler.

67. A method for testing a semiconductor component having a terminal contact comprising:

providing a board comprising at least one contact in electrical communication with test circuitry;

providing a substrate on the board comprising at least one contactor configured to simultaneously electrically engage the contact and the terminal contact, the contactor comprising a first contact on a first side of the substrate configured to electrically engage the terminal contact, a second contact on the second side in electrical communication with the first contact, and an anisotropic conductive polymer layer proximate to a second opposing side of the substrate configured to electrically engage the second contact and the contact;

placing the component on the board with the first contact in electrical communication with the terminal contact and the second contact in electrical communication with the contact; and

applying test signals through the terminal contact, the contact, the second contact, and the anisotropic conductive polymer layer to the component.

68. The method of claim 67 wherein the substrate is configured to float in a Z-direction on the board,

69. The method of claim 67 wherein the substrate comprises grooves on either side of the contactor electrically isolating the contactor and forming a flexible segment on the substrate for the contactor.

70. The method of claim 67 wherein the terminal contact comprises an element selected from the group consisting of leads, bumps and pads.

71. The method of claim 67 wherein the component comprises an element selected from the group consisting of packages, BGA devices and modules.

72. A method for testing a semiconductor component having a plurality of terminal contacts comprising:

providing a board comprising a plurality of contacts in electrical communication with test circuitry;

providing a floating substrate on the board;

providing a plurality of test contactors on the substrate, each test contactor comprising a flexible segment on the substrate, a first contact on a first side of the flexible segment configured to electrically engage a terminal contact, a second contact and on a second opposing side of the flexible segment in electrical communication with the first contact, and an anisotropic conductive polymer configured to electrically engage the second contact and a contact on the board;

placing the component on the substrate with the terminal contacts in electrical communication with the test contactors; and

applying test signals through the test contactors and the terminal contacts to the component.

73. The method of claim 72 wherein the test contactors comprise an element selected from the group consisting of gold and platinum.

74. The method of claim 72 wherein the first conductive polymer layer and the second conductive polymer layer comprise an elastomeric base material and a plurality of conductive particles in the base material.

75. The method of claim 72 wherein the flexible segments allow the test contactors to move independently to accommodate dimensional variations in the terminal contacts.

76. The method of claim 72 wherein the placing step is performed using a test handler.

77. The method of claim 72 wherein the substrate comprises an opening and the board comprises a pin for physically engaging the opening.

REMARKS

This divisional application is being filed due to the restriction requirement contained in the Office Action dated December 20, 2001, in parent case serial no. 09/652,826.

Also being submitted with this divisional application is an Information Disclosure Statement. Favorable consideration and allowance of claims 21-77 is respectfully requested. Should any issues arise that will advance this case to allowance, the Examiner is asked to contact the undersigned by telephone.

DATED this 31st day of December, 2001.

Respectfully submitted:

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December 31, 2001
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Stephen A. Gratton, Attorney for Applicants